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Further Observations on the Pilot Whale in Captivity[1]

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(Plates I & II)

Introduction

RECORDS on the behavior of a captive Atlantic pilot whale, *Globicephala macroryncha* Gray (Kritzler, 1952), and of captive Pacific pilot whales, *Globicephala scammonii* Cope (Brown, 1960), have shown that these delphinids generally adapt readily to confinement in large aquaria.

At Marineland of the Pacific, Marineland, California, Pacific pilot whales are exhibited with striped dolphins, *Lagenorhynchus obliquidens* Gill, in a circular tank 80 feet in diameter and 19 feet deep. Glass windows placed in three levels of corridors permit observations of what transpires beneath the surface. Observation of surface activity can be made from a "top deck" area, where seating facilities are provided.

Prior to January, 1959, the exhibit consisted of two female pilot whales and four striped dolphins (Brown, 1960). This paper describes the capture of a male pilot whale and the activity observed upon its introduction into the tank. An account of the sickness and death of a female pilot whale, including findings at necropsy, is given. The behavior of the male pilot whale at the time of this death is also described. Also presented are remarks on laryngeal withdrawal in certain odontocetes.

Behavior During Capture

On January 21, 1959, the Marineland collecting vessel, *Geronimo,* while operating in the Catalina Channel, California, encountered a very diffuse school of approximately 40 pilot whales. Several distinct pods were involved, some being almost a mile apart. Family groups were seen in which a male could be observed swimming with mother and young.

The men maneuvered their vessel close to what appeared to be a family group, consisting of a female, a calf and a larger male. The collector had the opportunity of rapidly snaring the latter animal, which for the first 35 minutes after becoming ensnared, towed the *Geronimo* around in large circles. The animal was quickly brought alongside the boat by winching in the nylon lead rope. No sounds were heard coming from him during any of these procedures, and while still attached to the line his dives consumed about five minutes. The animal had a tendency to dive and then rest at the end of the dive, leaving the line quite slack. The large size of the pilot whale made it impossible to lift him aboard, so, to effect his transport to Marineland, a deflated 20-foot rubber life raft was pulled beneath the animal, quickly inflated, and thus he was safely secured during the return trip to port.

The animal was measured and found to be 17 feet 3 inches long; his weight was estimated to be about 3,000 pounds.

Introduction into the Exhibit

The pilot whale made no movements in the raft during the return journey or while he was hoisted into the exhibit tank. Upon being released he quickly dived and began to swim slowly in a head down position, only inches from the floor of the tank. After being submerged for five minutes he surfaced to blow, and then again resumed the head down position, which he maintained for several hours, interrupted only by excursions to the surface to breathe.

At this time the female pilot whales appeared to show fear and swam rapidly together around the periphery of the tank, accompanied by the

[1]Contribution No. 18, Marineland of the Pacific Biological Laboratory.

striped dolphins which also appeared to show apprehension at the presence of the new arrival. Several hours later, toward the end of the day, the female whales commenced to rub their flipper tips against the male. The females were also seen to butt the melons of their heads against the larger melon of the male.

By the following morning the animals were quite familiar with one another and in the ensuing weeks, between feedings, spent their time swimming (Plate I, Fig. 1) or lying together in close formation on the surface in what appeared to be a resting position.

Feeding the New Arrival

Inducing newly arrived cetaceans to accept nourishment in capitivity is often difficult, owing to the stresses of capture, unusual confines of captive environment and the type of food the animal is expected to consume.

Inanition results rapidly in emaciation with most cetaceans. Pilot whales, probably as a result of their less active behavior, seem to withstand prolonged fasting with far less weight loss than the small delphinids (Brown, *et al.*, 1960; Brown & Norris, 1956). The first pilot whale captured by Marineland in 1957 responded to forced feeding on its eighth day in captivity (Brown, 1960) while the other female commenced to accept dead squid voluntarily after 14 days of fasting. No major loss of body weight occurred in either case.

The first attempt to feed the new pilot whale was made six days after his introduction into the tank; this was effected each evening by throwing large quantities of squid into the water. The active feeding behavior demonstrated by the other animals would, we hoped, initiate a favorable response in the new arrival. This technique proved successful, and on February 1 he began to feed and thereafter regularly accepted 100 pounds of squid each day.

The rapidity with which *Globicephala* usually adapts to captivity has already been discussed (see Kritzler, 1952, and Brown, 1960). The male pilot whale also quickly responded to the attendant's summons and within four weeks of his capture learned to lunge half of his body clear of the water to accept food from his trainer's hand.

It is remarkable that what must have been the animal's well established behavior pattern did not offer more resistance to such major environmental change. It is conceivable that the presence of the female pilot whales already established in the exhibit contributed largely to the adult animal's remarkably rapid integration into the group.

Sexual Behavior

Sexual behavior among the pilot whales in Marineland of the Pacific has been seen sporadically throughout the spring and winter months. The first of the following observations was made only 25 days after the male's admission into the tank.

February 15, 8:00 a.m. Both female pilot whales were observed swimming around and rubbing against the ventral surface of male's body. After several minutes of this activity the three animals swam almost to the floor of the tank and commenced to butt their heads together with great force. The larger female moved away and began to rub her genital opening on the floor of the tank. The smaller female and the male commenced to slowly swim together, the smaller animal swimming upside down, in a position immediately under and considerably forward of the male. In this position she was seen to arch her body and vigorously rub her genital opening between the flippers of the larger animal. At this time the male extruded its penis, and when the female moved back to a position where her ventral surface approximated his, several attempts at intromission were made. Despite the female's apparent sexual receptiveness, however, penetration was not achieved.

April 1, 9:45 a.m. This morning a loud creaking sound was heard coming from the circular tank; investigation revealed the large pilot whale very active, rubbing himself against the females. The vocalization emanated from the large whale and was not accompanied by any emission of air. The sounds produced were similar to the creaking of a rusty hinge. This activity appeared to disturb the striped dolphins which were rapidly swimming around the tank in close formation. The glans penis was protruding from the male's genital opening at this time.

April 17, 10:00 a.m. The large female was swimming against and rubbing her genital opening on the ventral surface of the male. The striped dolphins again appeared very active and were also seen to rub against the male pilot whale. The two larger animals then sank to floor of tank and upon confronting each other some 30 feet apart swam at each other, butting the melons of their heads together with great force. On several occasions the smaller female through force of impact was thrust backward through the water several feet; the whip-like crack produced by these collisions could be clearly heard outside the tank. After indulging in this behavior several minutes, the male had an erection, and although the female drifted passively in the water and appeared receptive, many attempts at intromission again proved unsuccessful.

October 28, 7:30 a.m. This morning the smaller female was observed rubbing the ventral surface of her body against male's and trailing her flippers and dorsal fin over the larger animal's genital opening. After two or three minutes of this play, the male extruded about 18 inches of his penis and tried to effect intromission. Penetration occurred briefly, whereupon the male returned to a resting position on the surface, and was eventually joined by the female.

November 7, 11:30 a.m. The male pilot whale was swimming around tank with his penis extruded about twelve inches. The smaller female forcibly butted him on his side and then assumed the position noted on February 15, 1959. Intromission was again attempted.

November 14, 9:30 a.m. There was considerably activity in the whale tank this morning. Both female pilot whales were rubbing against male, who maintained a head down position. The animals were extremely vocal and produced a bleating or crying sound and a loud buzzing noise, which had not been heard before. These vocalizations were not accompanied by any emission of air from the animal's blowholes.

At 10:30 a.m. diver G. McLaughlin reported the male lying on his back at the surface with his penis extruded about 24 inches.

Other behavior of probable sexual significance has been observed many times in both male and female pilot whales. McBride & Hebb (1948) recorded similar behavior in male *Tursiops* while Tavolga & Essapian, (1957) described unpaired female *Tursiops* engaged in unusual activities of a sexual nature.

The male pilot whale is often observed rubbing his genital opening on the floor of the tank and sometimes on these occasions the animal utilizes a piece of stone; by means of body movements he attempts to rub this against the wall of the genital orifice or the glans penis, which is usually extruded at this time. The females also employ the tank floor in a similar manner. The diving ladder has been rubbed by the smaller whales so violently it has become loosened at its mountings.

Brown & Norris (1956) record sexual stimulation of male *Tursiops* by underwater petting. On one occasion a diver while swimming with the male pilot whale and patting his sides elicited an identical response; the male extruded his penis and moved towards the man.

Tavolga & Essapian (1957) have described the sexual behavior of the bottlenosed dolphin, *Tursiops truncatus* Montagu, and they state that the dominant role during courtship is assumed by the male. The observations at Marineland on interspecific mating activity between female *Lagenorhynchus* and male *Tursiops* (Brown & Norris, 1956) and more recently between *Globicephala* are contrary to those described in *Tursiops* by the above authors. Observations made at Marineland generally show the female to be responsible for the initiation of precopulatory behavior.

It would appear that the wide range of sexual behavior recorded in male *Tursiops* by McBride & Hebb (1948) and Brown & Norris (1956) is not so apparent in *Globicephala,* but it must also be noted that this statement is made after observing only one captive adult male. It is possible that younger males demonstrate a broader field of sexual proclivity.

Observations on the mating activity of *Tursiops truncatus* show that little difficulty is experienced by these smaller active animals in effecting penetration. An individual upon producing an erection is able to swing the penis around in a half circle and thus can achieve intromission with an approach from either side, and by swinging on its back under the female is able to contrive intromission by a powerful vertical flexure of its body.

The male pilot whale appears to lack this underwater dexterity, and the females seem to play the major role in precopulatory body positioning. Before erection, the male's penis is enclosed within the genital sheath. When fully extended it is about 24 inches long and approximately six inches in diameter at its base. The shaft tapers to an apex surmounted by a vermiform glans some four inches long. Unlike that of *Tursiops* the penis is not rigid but flexuous, upon extension its contortions giving the false impression of independent movement. During the several attempted and one successful intromission, strong pelvic thrusts were seen.

Aggressive Behavior

In a previous paper (Brown, 1960), aggressive behavior in a female pilot whale after months of solitary confinement was recorded. After being transferred to a tank with another whale, these aggressive actions ceased. Except for one incident, to be discussed later, the male has not directed aggressive behavior towards any man, and has allowed divers to grasp his flippers or dorsal fin as he swam around the tank. This was stopped after the small female made attempts to ram and bite the man involved.

Interspecific Relationship and Play

Schools of *Globicephala* and *Lagenorhynchus* are commonly seen swimming and feeding to-

gether in the Catalina Channel. In February, 1957, during the capture of a pilot whale, several striped dolphins accompanied the snared whale to within a few feet of the hull of the *Geronimo*.

Interspecific behavior has also been seen in the circular tank. Of particular interest is the association between a female whale and a female dolphin. This first became apparent during the spring of 1960 when they spent many days playing together, their favorite sport being to catch the air emitted from each other's blowhole. A variation of this play took place below the water-inlet jets where each animal in turn released air into the current.

Behavior of a possible homosexual nature has occurred between this pair; the dolphin nuzzled the genital opening of the whale, which then did the same to her companion.

On occasion the dolphins "tease" the pilot whales by biting their flukes. At this writing, the male is subject to this treatment, and he is seen to pursue the agile dolphins, who easily evade his rushes.

The diver's hose provides a constant source of interest to the whales, who loop the hose around their pectoral flippers and rub it with their bodies. On one occasion a man wearing a Desco mask was pulled around the tank for several minutes by the male, who seized the airline in his mouth.

Sickness and Death of a Pilot Whale

The large female pilot whale had lived at Marineland since January, 1957. During the initial months of capitivity she swallowed a rubber innertube, but after oral administration of mineral oil, the tube was regurgitated (Brown, 1960). Following this incident, the animal maintained good health until inception of the fatal sickness now to be described.

On March 2, 1960, symptoms of a gastroenteric disorder became apparent and vomiting occurred regularly after feeding. This made oral medication difficult. However, some mineral oil given in squid was retained. The animal showed no other abnormality and continued swimming activity around the tank.

March 3. The whale's condition not improved, emesis occurs after eating even small quantities of food. Attempts at medication unsuccessful. Mineral oil and kaopectate regurgitated almost immediately upon administration.

March 4. Still avidly accepts food, all of which is lost shortly after ingestion. Today quite inactive between attempted feedings and lies on surface with eyes closed.

4:30 p.m. The antispasmodic, methyl - atropine - nitrate (Metropine), given in food and apparently retained. An additional feeding at 5:00 p.m. induced vomition. Metropine again given in food at 12:00 a.m.; air and cloudy fluid expelled at 12:15 a.m.

March 5. 9:00 a.m. This morning general condition seems improved, animal active and swimming with other whales. At 9:30 a.m., Metropine given in food; some loss of fluid and discharge of air seen shortly after feeding. Animal retained all of food given during remainder of day. Apart from oral air and fluid loss, behavior quite normal.

March 6. Animal vomited during the night; considerable quantities of predigested food found floating in center of tank. Refused to swim to the feeding platform and spent the day lying on the surface with eyes closed, occasionally sounding to the floor of the tank.

March 7. The whale's condition remains unchanged. At 9:45 a.m. vomits cloudy fluid, and at 12:15 a.m. seen slowly swimming with male, eyes closed; At this time vocalized several times, making high pitched squeals which were accompanied by air emissions from blowhole.

At 2:00 p.m. returned to surface and stayed in same position for remainder of the day.

March 8. 4:00 a.m. Female lying with other whales at the surface of the tank, respiration rapid and shallow. This was the last observation made prior to death.

Behavior of the Male Pilot Whale

At 5:30 a.m. on March 8, the male pilot whale was first seen transporting the dead female to and from the surface by grasping her flipper in his mouth (Plate 1, Fig. 2). He carried her in this fashion for the next five hours. An erection occurred at 8:15 a.m., and on several

occasions he effected intromission with the dead animal. A diver entered the tank at 8:45 a.m. and endeavored to pass a rope around the female's tail. On seeing this, the male momentarily released his burden and tried to strike the man with his head. To entice the male to leave the dead animal, squid was thrown into the water, but he ignored this, seized the female and continued to carry her around the tank. Another diver entered the water, and the whale became more active. Swimming at great speed around the tank, he emitted bleating sounds and recommenced copulation with the dead female. The other female at this time began to vocalize and tried to push a diver with her head.

While endeavoring to evade the divers, the big male dropped the dead animal, which lodged between the rocks cemented to the floor of the tank. He then seized the caudal peduncle in his mouth and again succeeded in lifting the body to the surface, where he changed his hold firstly to the dorsal fin and then the flipper. In recovering the body he displaced several rocks; one large boulder weighing at least 700 pounds was propelled completely across the bottom of the tank. At 9:45 a.m. the diver finally succeeded in passing a line around the dead female's tail. The male then offered little resistance to her removal from the tank, and shortly thereafter accepted food in a normal way.

Our collectors have seen behavior of a similar nature in wild pilot whales, and report two cases of female whales supporting dead young. Several authors (see McBride & Hebb, 1948, Moore, 1953, and Hubbs 1953) have also recorded such actions in *Tursiops*.

While these mother-young relationships are not beyond interpretation, the behavior of the male pilot whale is difficult to translate. The complex social behavior of this species and the environmental restrictions of captivity without doubt furnished behavioral stimuli at this time.

Necropsy

The dead female pilot whale had increased 23 inches in total length during the three years and two months she had been in captivity and weighed 1,360 pounds. Postmortem examination was performed on the day of death by veterinary pathologists of the Los Angeles County Livestock Department. Necropsy showed chronic enteritis. Submucosal hemorrhages with petechiae up to 3 mm. in size were found throughout the entire intestinal tract (Plate II, Fig. 3). Further investigation however, revealed laryngeal occlusion as the primary cause of death.

The following is an excerpt from the pathologist's report: "When the whale's head was totally severed from the body, a piece of rock fell to the floor, its origin unknown at that time. I approached the severed head from its posterior aspect and proceeded to dissect the remaining part of the trachea, larynx and esophagus. I was able to enter my hand into the pharyngeal area. By grasping the elongated epiglottis and arytenoid structures, then depressing and retracting, I was able to force this anterior part of the larynx out of the pharyngeal chamber. Further traction on the larynx with one hand and incision of the ventral attaching structure with the other hand resulted in my freeing the aforementioned structures.

"Dissection and examination of these structures revealed a well defined localized lesion of the mucous membrane on the floor and partly on the side walls of the larynx in the region of the thyroid cartilage.

"This lesion was approximately 5 cm. long, extended up each side wall about 3 cm. at its longest points. It was irregular in form but well demarcated. The pathological change of the mucous membrane was that of passive congestion, and edema not to the point of macroscopic necrosis. It was evident this lesion was due to pressure of the rock. Thorough examination of the esophagus, pharynx and trachea revealed no gross lesions."

Discussion

During the months preceding the death of the large female, the whales were often seen mouthing fragments of stone separated from the reefs on the floor of the tank. The female pilot whale seemed particularly prone to this activity and was frequently seen to ingest, and then expel, the stone involved.

The fatal consequences of this behavior were revealed by the pathology just described, and it is evident that laryngeal occlusion induced by inspiration of a stone was the primary cause of death. It is assumed that the enteric lesions were secondary in this case.

The etiologic implications are apparent. It is quite plain that the stone gained access through the glottis into the aryteno-epiglottid tube, after entry into the palatopharyngeal region via the mouth. Oral entry was supported by subsequent investigation, which showed the stone too large to pass the bony nares of the skull (Plate II, Fig. 4). It is not illogical to assume that vomition occurred after the stone had been swallowed; during emesis, and involuntary retraction of the aryteno-epiglottid tube, the stone passed into the dilated sphincter of the naso-pharynx. Reinsertion of the tube and respiratory action

caused its migration into the laryngeal structure.

Since the death of the pilot whale, laryngeal retraction has been recorded in a male bottlenose dolphin. This was observed while treating a lesion in the commisure of the animal's mouth. While his jaws were being forcibly held apart, he convulsed and vomited. When the animal's jaws were released, he violently exhaled and expelled vomitus through his blowhole.

It is evident that the opening of the mouth withdrew the larnyx from the nasal cavity; the enforced withdrawal prevented respiration, inducing convulsion and regurgitation. Vomitus then entered the vacated nasopharynx. Upon allowing the mouth to close, the aryteno-epiglottid tube reentered the narial cavity. The powerful exhalation cleared the nasal passage. It would then appear that on full expansion of the jaws the tube is retracted by action of the throat muscles connected to the hyoid bone.

The ability to disengage the larynx from the narial cavity by full expansion of the jaws is perhaps possessed by all odontocete whales, and possibly facilitates the passage of large items of food through the esophagus.

Acknowledgements

The author wishes to express his sincere appreciation to Dr. Rankin W. McIntyre and Dr. Maurice Barenfus for their skillful postmortem examination of the dead pilot whale, and also to Mrs. Muriel Johnson for her help in preparing the manuscript. He also wishes to thank Captain Frank Brocato and Frank Calandrino of the *Geronimo* for observations made during the capture of the male pilot whale.

References

Brown, D. H.
1960. Behavior of a captive Pacific pilot whale. Jour. Mamm., 41: 342-349.

Brown, D. H., R. W. McIntyre, C. A. Delliquadri & R. J. Schroeder
1960. Health problems of captive dolphins and seals. Jour. Amer. Vet. Med. Assoc., 137 (9): 534-538.

Brown, D. H. & K. S. Norris
1956. Observations of captive and wild cetaceans. Jour. Mamm., 37: 311-326.

Hubbs, C. L.
1953. Dolphin protecting dead young. Jour. Mamm., 34: 498.

Kritzler, H.
1952. Observations on the pilot whale in captivity. Jour. Mamm., 33: 321-334.

McBride, A. F. & D. O. Hebb
1948. Behavior of the captive bottle-nosed dolphin *Tursiops truncatus*. Jour. Comp. and Physiol. Psych., 41: 111-123.

Moore, J. C.
1953. Distribution of marine mammals to Florida waters. Amer. Mid. Nat., 49: 117-158.

Tavolga, M. C., & F. S. Essapian
1957. The behavior of the bottle-nosed dolphin (*Tursiops truncatus*): mating, pregnancy, parturition and mother-infant behavior. Zoologica, 42 (2): 11-31.

EXPLANATION OF THE PLATES

Plate I

Fig. 1. Male pilot whale accompanied by females in the circular tank, Marineland of the Pacific. (Photograph by Peter Stackpole).

Fig. 2. Male pilot whale carrying dead female in circular tank, Marineland of the Pacific. (Photograph by Robert Vanderhoof).

Plate II

Fig. 3. Opened lower intestine of pilot whale, showing enteritis and submucosal hemorrhage. (Photograph by J. Courtland Beazie).

Fig. 4. Skull of pilot whale demonstrating the size of stone in relation to the bony nares. (Photograph by J. Courtland Beazie).